

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In Re:	Huwei Tan	Confirmation No:	8501
Application No:	10/816,110	Group:	3768
Filed:	April 1, 2004	Examiner:	Fernandez, Katherine L.
For:	Method and System for Dual Domain Discrimination of Vulnerable Plaque		
Customer No.:	29127		
Attorney Docket No.	0010.0010US1		

**DECLARATION OF PRIOR INVENTION UNDER RULE 37 CFR 1.131**

I, being warned of the penalties for perjury, hereby declare and make the following statements:

1. The Patent Office cited U.S. Patent Publ. No. 2004/0024298A1 to Marshik-Geurts, *et al.* (published on February 5, 2004) in rejecting Claims 1-53 under 35 U.S.C. 103 (a).
2. The invention claimed in the above-referenced U.S. patent application Serial Number 10/816,110 was conceived and reduced to practice by me at least as early as February 5, 2004.
3. In more detail, I had conceived of the invention as currently claimed prior to February 5, 2004. This conclusion is supported by the slides attached as Attachments 1 and 2 dated September 19, 2003. These slides describe the use of Dual-Domain Discrimination Analysis for blood vessel analysis.

4. Moreover, I had reduced this invention to practice prior to February 5, 2004. This conclusion is supported by the slides attached as Attachments 3 and 4. Specifically as of September 19, 2003, I had used Dual Domain spectral analysis on spectroscopic data from blood vessels and established performance improvements relative to PLS-DA (Principal Components Analysis Discrimination Analysis). See Attachment 3. This conclusion is further supported by Attachment 4. This slide illustrates the improved performance over blood distance for Dual Domain spectral analysis with respect to PLS-DA.
5. At the time that I made the claimed invention, I was under a duty to assign the invention to InfraReDx, Inc.

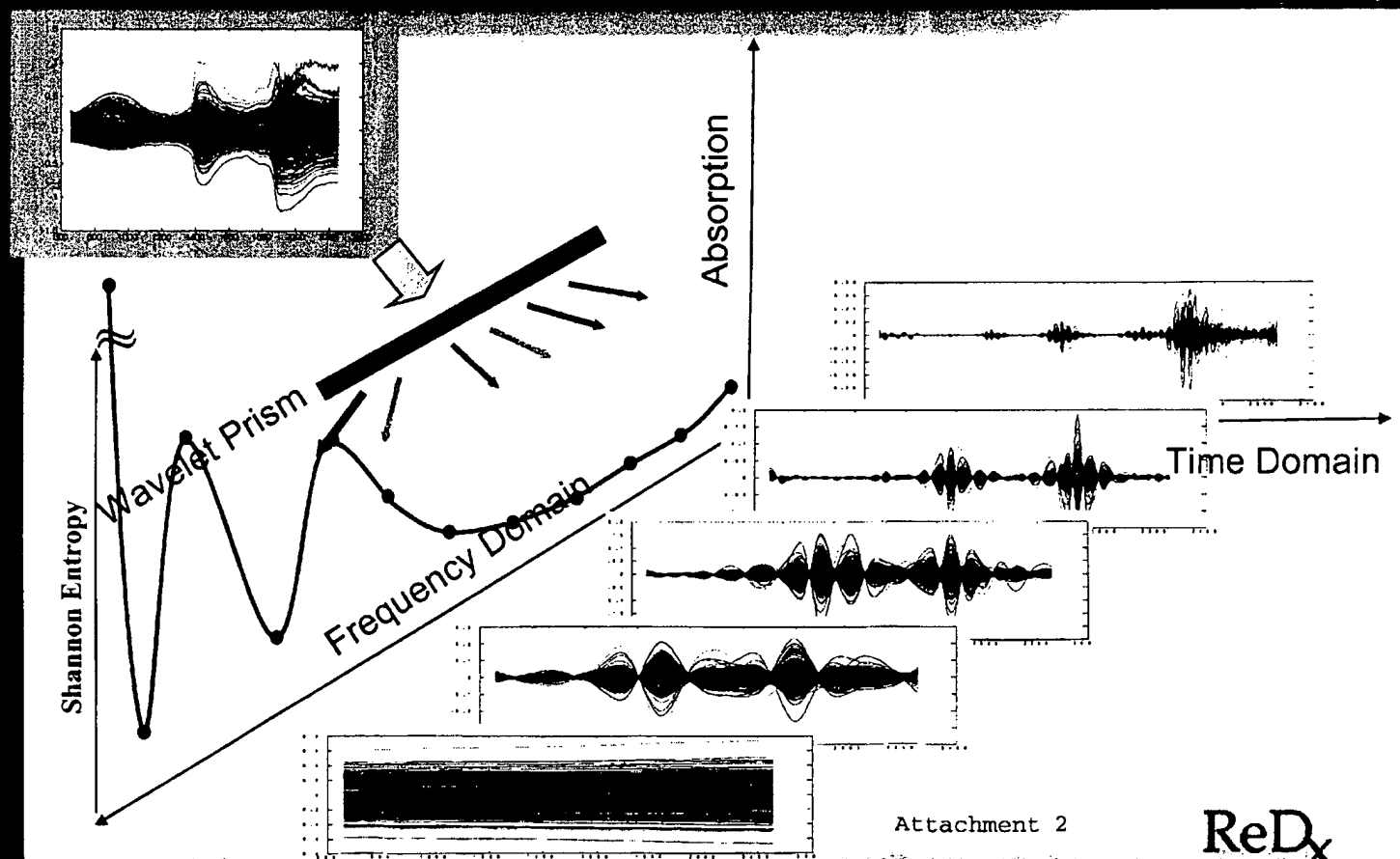
Huwei Tan

Huwei Tan Dated 11/26/07

## Introduction

- Spectra are local in nature in time (wavelength) and frequency domains
- Regular methods, such as, PLS, PCR, and PCA, lack of ability to deal with spectral signals simultaneously according to frequency and time
- Dual-Domain Discrimination Analysis (DDDA) in combination of advantage of wavelet transform (WT) will model signal simultaneously in both domains
  - More chance to isolate the non-interesting variation in spectra
  - More robust against variations in instrument and environment conditions, e. g, broad-band spectral variation contributed from water, heart motion, and other non-interesting interferences
  - Higher sensitivity and specificity, compared with regular models currently used

# Wavelet Prism and Concept of Dual-Domain NIR Spectra

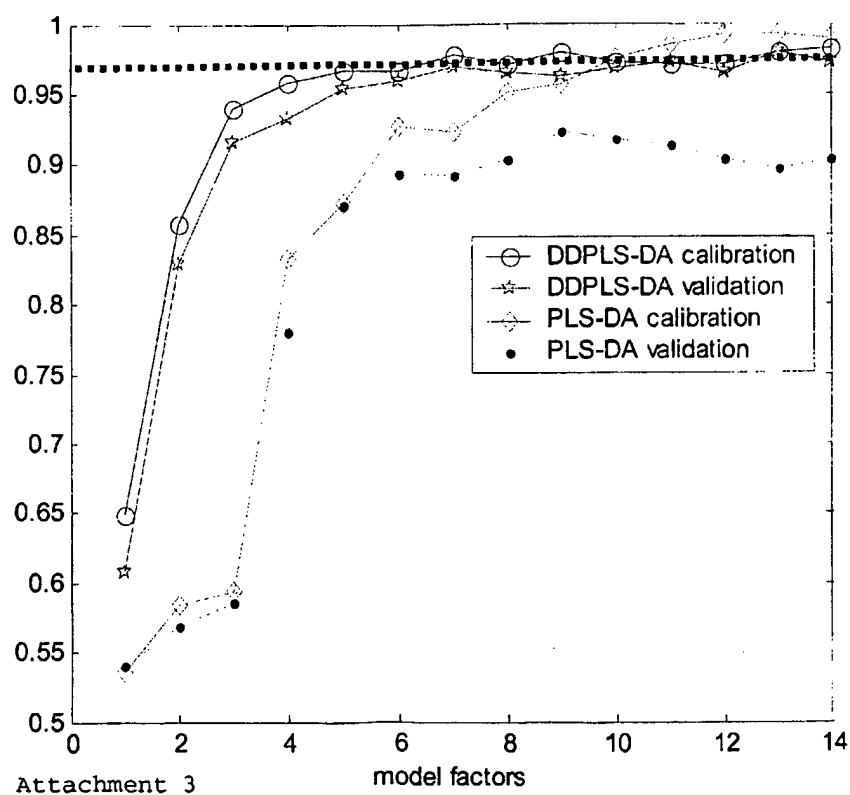


ReD<sub>x</sub>

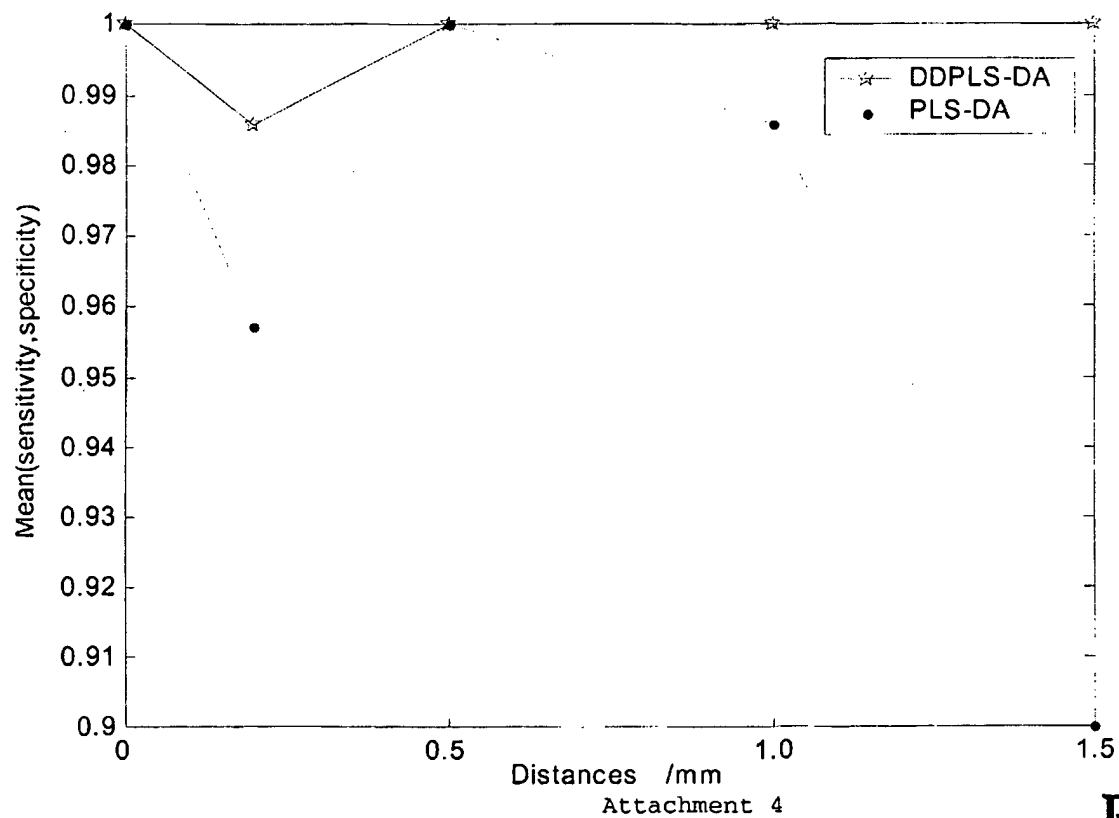
# Preliminary Comparison of DDDA and Regular PLS-DA

- Validation

- Half samples in calibration set for cross-validation
- Half samples in validation set for a full validation



## Comparison over Blood Distances



ReD<sub>x</sub>



UNITED STATES  
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OCTOBER 06, 2003

PTAS

Under Secretary of Commerce For Intellectual Property and  
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J. GRANT HOUSTON  
4 MILITIA DRIVE, SUITE 4  
LEXINGTON, MA 02421



\*102441844A\*

UNITED STATES PATENT AND TRADEMARK OFFICE  
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RECORDATION DATE: 04/30/2003

REEL/FRAME: 014024/0916  
NUMBER OF PAGES: 3

BRIEF: ASSIGNMENT OF ASSIGNOR'S INTEREST (SEE DOCUMENT FOR DETAILS).

ASSIGNOR:

MARSHIK-GEURTS, BARBARA J.

DOC DATE: 04/29/2003

ASSIGNOR:

TAN, HUWEI

DOC DATE: 04/29/2003

ASSIGNEE:

INFRAREDIX, INC.  
125 CAMBRIDGE PARK DRIVE  
CAMBRIDGE, MASSACHUSETTS 02140

SERIAL NUMBER: 10426750  
PATENT NUMBER:

FILING DATE: 04/30/2003  
ISSUE DATE:

MARCUS KIRK, EXAMINER  
ASSIGNMENT DIVISION  
OFFICE OF PUBLIC RECORDS

05-07-2003

Form PTO-1595  
(Rev. 03/01)

OMB No. 0651-0027 (exp. 5/31/2002)

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102441844

U.S. DEPARTMENT OF COMMERCE  
U.S. Patent and Trademark Office

To the Honorable Commissioner of Patents and Trademarks: Please record the attached original documents or copy thereof.

## 1. Name of conveying party(ies):

Barbara J. Marshik-Geurts  
Huwei Tan

4-30-03

## 2. Name and address of receiving party(ies)

Name: InfraReDx, Inc.

Internal Address: \_\_\_\_\_

Additional name(s) of conveying party(ies) attached? ☐ Yes ☒ No

## 3. Nature of conveyance:

- ☒ Assignment ☐ Merger  
☐ Security Agreement ☐ Change of Name  
☐ Other \_\_\_\_\_

Execution Date: 04/29/03

Street Address: 125 CambridgePark Drive

City: Cambridge State: MA Zip: 02140

Additional name(s) & address(es) attached? ☐ Yes ☒ No

## 4. Application number(s) or patent number(s):

If this document is being filed together with a new application, the execution date of the application is: 04/29/03

A. Patent Application No.(s) \_\_\_\_\_

B. Patent No.(s) \_\_\_\_\_

Additional numbers attached? ☐ Yes ☒ No

## 5. Name and address of party to whom correspondence concerning document should be mailed:

Name: J. Grant Houston

Internal Address: \_\_\_\_\_

Street Address: 4 Militia Drive, Suite 4

City: Lexington State: MA Zip: 02421

## 6. Total number of applications and patents involved: 1

7. Total fee (37 CFR 3.41).....\$ 40.00

- ☒ Enclosed  
☒ Authorized to be charged to deposit account

## 8. Deposit account number:

502 233

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## 9. Signature.

J. Grant Houston

Name of Person Signing

Signature

4/30/03

Date

Total number of pages including cover sheet, attachments, and documents: 3

Mail documents to be recorded with required cover sheet information to:  
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 Washington, D.C. 20231

11000 U.S. PTO  
10/426750

04/30/03

05/02/2003  
04 FC:802

BSA10611-00000026-10426750

40.00 OP



29 April 2003  
Docket: 0010.0004

ASSIGNMENT

WHEREAS, we, Barbara J. Marshik-Geurts and Huwei Tan, have invented a certain improvement in "Spectroscopic Unwanted Spectral Signal Filters for Discrimination of Vulnerable Plaque and System Therefor" described in an application for Letters Patent of the United States, the specification of which:

[ X ] is being executed on even date herewith and is about to be filed in the United States Patent Office;

[ ] was filed on [ ] as Application No. [ ];

[ ] was patented under U.S. Patent No. [ ] on [ ].

WHEREAS, InfraRedx, Inc. (hereinafter "ASSIGNEE"), a corporation organized and existing under the laws of Delaware, and having a usual place of business at 125 CambridgePark Drive, Cambridge, Massachusetts, 02140, desires to acquire an interest therein in accordance with agreements duly entered into with us;

NOW, THEREFORE, to all whom it may concern be it known that for and in consideration of said agreements and of other good and valuable consideration, the receipt of which is hereby acknowledged, we have sold, assigned and transferred and by these presents do hereby sell, assign and transfer unto said ASSIGNEE, its successors, assigns and legal representatives, the entire right, title and interest in and throughout the United States of America, its territories and all foreign countries, in and to said invention as described in said application, together with the entire right, title and interest in and to said application and such Letters Patent as may issue thereon; said invention, application and Letters Patent to be held and enjoyed by said ASSIGNEE for its own use and behalf and for its successors, assigns and legal representatives, to the full end of the term for which said Letters Patent may be granted as fully and entirely as the same would have been held by us had this assignment and sale not been made; We hereby convey all rights arising under or pursuant to any and all international agreements, treaties or laws relating to the protection of industrial property by filing any such applications for Letters Patent. We hereby acknowledge that this assignment, being of the entire right, title and interest in and to said invention, carries with it the right in ASSIGNEE to apply for and obtain from competent authorities in all countries of the world any and all Letters Patent by attorneys and agents of ASSIGNEE's selection and the right to procure the grant of all such Letters Patent to ASSIGNEE for its own name as assignee of the entire right, title and interest therein;

AND, we hereby further agree for ourselves and our executors and administrators to

29 April 2003  
Docket: 0010.0004

execute upon request any other lawful documents and likewise to perform any other lawful acts which may be deemed necessary to secure fully the aforesaid invention to said ASSIGNEE, its successors, assigns and legal representatives, but at its or their expense and charges, including the execution of applications for patents in foreign countries, and the execution of substitution, reissue, divisional or continuation applications and preliminary or other statements and the giving of testimony in any interference or other proceeding in which said invention or any application or patent directed thereto may be involved;

AND, we do hereby authorize and request the Commissioner of Patents of the United States to issue such Letters Patent as shall be granted upon said application or applications based thereon to said ASSIGNEE, its successors, assigns, and legal representatives.

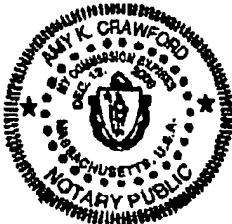
  
Barbara J. Marshik-Geurts

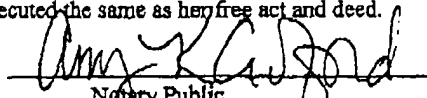
Commonwealth of Massachusetts )

:SS.

County of Middlesex )

On this day, April 29, 2003, before me, the subscriber, personally came Barbara J. Marshik-Geurts to me known and known to me to be the same person described in and who executed the foregoing instrument, and duly acknowledged to me that she executed the same as her free act and deed.



  
Notary Public

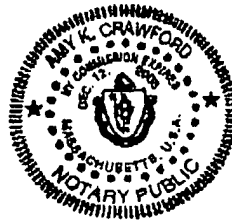
  
Huwei Tan

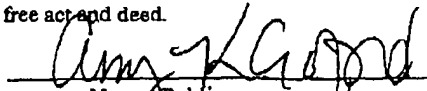
Commonwealth of Massachusetts )

:SS.

County of Middlesex )

On this day, April 29, 2003, before me, the subscriber, personally came Huawei Tan to me known and known to me to be the same person described in and who executed the foregoing instrument, and duly acknowledged to me that he executed the same as his free act and deed.



  
Notary Public